Prince George Ambient Air Monitoring Program
1999 Air Quality Data Summary

INTRODUCTION

The 1999 Prince George Air Quality Data Summary summarizes the data of the joint government/industry program to monitor reduced sulphur (TRS), sulphur dioxide (SO_2), nitrogen oxides (NO_x), particulate less than ten microns (PM_{10}), particulate less than two and half microns ($PM_{2.5}$), and ground level ozone (O_3) in Prince George.

Interpretation of the data is not provided in this summary report, but will be available in the final Annual Air Quality Report. Anyone wishing further information on the data in this summary or on the monitoring network should contact one of the people listed at the bottom of this page.

CONCLUSIONS

a) The total reduced sulphur (TRS) Provincial Level A one-hour objective (7µg/m^3) was exceeded a maximum of 13.4% of time, at the Jail station, and a minimum of 2.1% at the Lakewood station. TRS levels in the Prince George area in 1999 exceeded the Provincial Level B one hour objective (28 µg/m^3) from 0.01% of the time at the Lakewood station to 0.5% of the time at the Jail station. Annual averages for three out of the last four years at the Jail were less than 3 ug/m^3 and were the three lowest annual averages ever recorded at this site since monitoring began at the Jail. Plaza also recorded its three lowest annual averages in the past four years.

b) The CBC Transmitter station recorded the highest average annual SO_2 concentration (13.0 µg/m^3) in 1999. Other monitoring sites, Downtown-Plaza 400, and the Jail site, recorded annual averages of 7.2 µg/m^3 and 10.0 µg/m^3, respectively. The CBC station also recorded the most exceedances of the Level A one-hour objective (11) and the highest one-hour average concentration (751 µg/m^3). The Plaza site recorded only one exceedance of the Level A one-hour objective, and no exceedances were recorded at the Jail site. Annual average SO2 concentrations recorded at the Plaza and CBC sites were the lowest to be recorded since monitoring began at these sites.

c) Lakewood recorded the lowest annual average of the six PM_{10} non-continuous monitoring stations. The CNR site recorded the highest annual average of 28.0 µg/m^3. The BCR site recorded the greatest number of exceedances of the Level B daily criteria (50 µg/m^3) for both the continuous and non-continuous monitoring sites.

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1.0 TOTAL REDUCED SULPHUR (TRS) RESULTS

TRS describes a group of sulphur compounds containing gases made up primarily of four compounds; dimethyl disulphide (DMDS), dimethyl sulphide (DMS), methyl mercaptan (MESH), and hydrogen sulphide (H_2S).

These compounds are largely by-products of the pulping process, that is, these compounds are not added directly but form because of the use of other sulphides in the pulping process. Pulp mills using the kraft process emit the largest amounts of TRS (in Prince George) followed by oil and gas processing plants (refining) and to a small extent automobiles (catalytic converters). Natural sources include swamps, bogs, and marshes.

Tables 1.1 to 1.4 list monthly summaries of TRS concentrations for each of the Prince George TRS ambient air stations and their respective annual summary for 1999.

Table 1.1
1999 Monthly Summary of TRS Data at Jail

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>7$\mu g/m^3$	>28$\mu g/m^3$	($\mu g/m^3$)	>3$\mu g/m^3$	>6$\mu g/m^3$	($\mu g/m^3$)
January	1.5	58	0	20	6	2	8.6
February	2.6	93	3	37	9	3	14.8
March	3.3	125	11	123	11	6	23.0
April	1.2	51	0	26	5	1	8.3
May	1.2	31	0	20	3	1	7.8
June	2.2	88	1	28	10	2	8.6
July	3.2	92	5	50	12	7	10.6
August	3.3	132	7	40	16	5	13.7
September	3.1	125	1	28	9	6	16.1
October	2.1	95	2	30	10	3	13.1
November	2.3	94	0	27	10	3	8.6
December	3.7	101	14	40	6	4	26.5
Annual	**2.5**	**1085**	**44**	**123**	**107**	**43**	**26.5**

B.C. Ambient Air Quality Objectives Total Reduced Sulphur (TRS)	Level A	Level B
One Hour Average	7 $\mu g/m^3$	28 $\mu g/m^3$
24 Hour Average	3 $\mu g/m^3$	6 $\mu g/m^3$

Table 1.2
1999 Monthly Summary of TRS Data at Plaza

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>7$\mu g/m^3$	>28$\mu g/m^3$	($\mu g/m^3$)	>3$\mu g/m^3$	>6$\mu g/m^3$	($\mu g/m^3$)
January	1.2	53	0	24	3	2	8.9
February	2.5	105	2	33	10	2	14.2
March	2.5	98	5	44	10	4	10.4
April	0.6	15	0	17	1	0	3.8
May	0.5	13	0	13	1	0	4.6
June	1.2	44	0	27	2	1	6.7
July	1.1	45	2	34	6	1	9.3
August	2.5	79	2	40	12	1	9.4
September	2.2	78	2	28	7	4	12.4
October	1.4	55	0	24	3	2	12.9
November	1.8	84	0	18	8	2	8.0
December	2.8	115	0	27	8	5	18.5
Annual	**1.7**	**784**	**13**	**44**	**71**	**24**	**18.5**

Table 1.3
1999 Monthly Summary of TRS Data at Lakewood

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>7$\mu g/m^3$	>28$\mu g/m^3$	($\mu g/m^3$)	>3$\mu g/m^3$	>6$\mu g/m^3$	($\mu g/m^3$)
January	0.8	22	1	28	2	1	7.9
February	1.3	41	0	20	4	2	8.7
March	0.6	12	0	18	1	0	3.9
April	0.2	0	0	6	0	0	1.7
May	0.2	0	0	4	0	0	1.2
June	0.3	5	0	14	0	0	2.0
July	0.2	6	0	9	0	0	2.5
August	0.7	4	0	10	0	0	2.8
September	0.6	21	0	13	2	0	4.4
October	0.9	8	0	20	1	0	5.5
November	0.8	13	0	13	1	0	4.3
December	1.0	40	0	18	3	2	9.5
Annual	**0.6**	**172**	**1**	**28**	**14**	**5**	**9.5**

Table 1.4
1999 Monthly Summary of TRS Data at Hart Highlands – Glenview

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>7$\mu g/m^3$	>28$\mu g/m^3$	($\mu g/m^3$)	>3$\mu g/m^3$	>6$\mu g/m^3$	($\mu g/m^3$)
January	0.2	0	0	5.7	0	0	2.1
February	0.0	0	0	1.4	0	0	0.3
March	0.2	0	0	4.3	0	0	1.2
April	0.0	0	0	4.3	0	0	0.5
May	0.0	0	0	1.4	0	0	0.4
June	0.1	0	0	1.4	0	0	0.7
July	0.3	0	0	2.8	0	0	1.2
Annual	**3.1**	**0**	**0**	**5.7**	**0**	**0**	**2.1**

Monthly averages ranged from a high of 3.7 $\mu g/m^3$ at Jail (December) to a low of 0.0 $\mu g/m^3$ at the Hart Highlands - Glenview (February, April and May). Jail had the highest annual average followed by Plaza and then Lakewood. The Hart Highlands site was not included as only a partial year of monitoring is available.

1.1 TRS Annual Trends

The TRS data from the Plaza (1980-1999), the Jail (1981-1999), and Lakewood (1982-1999) stations were examined to reveal trends in Prince George. The following tables (Table 1.5 - Table 1.7) summarize the TRS data from the three stations over the last eighteen to twenty years.

A major improvement in TRS levels have occurred from 1988 to 1990. Since 1990 TRS levels have declined slightly from year to year. The annual average concentrations for Plaza and Jail are one of the lowest since the monitoring program started. Annual averages in 1999 at the Plaza and Jail stations are approximately 75% lower than the 1986-1989 averages.

Table 1.5
Annual Trend Summary of TRS Data at Jail

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >7$\mu g/m^3$	>28$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >3$\mu g/m^3$	>6$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of hours Instrument Operated
1981	7.2	1673 (21.7%)	638 (8.3%)	177	151 (47.0%)	121 (37.7%)	59.6	7701
1982	8.8	1169 (23.8%)	519 (10.6%)	149	125 (61.0%)	99 (48.3%)	53.5	4915
1983	11.0	2051 (27.3%)	1066 (14.2%)	156	184 (58.8%)	151 (48.2%)	70.2	7511
1984	6.5	1341 (17.6%)	593 (7.8%)	170	136 (42.8%)	109 (34.3%)	54.8	7638
1985	6.4	1483 (19.1%)	546 (7.0%)	149	145 (44.8%)	117 (36.1%)	44.9	7773
1986	9.8	2404 (29.1%)	1028 (12.4%)	347	197 (57.1%)	169 (49.0%)	68.0	8268
1987	11.6	2268 (29.0%)	1306 (16.7%)	382	200 (59.0%)	175 (51.6%)	86.0	7817
1988	11.6	2307 (27.9%)	1343 (16.2%)	312	197 (54.6%)	166 (46.0%)	94.6	8267
1989	9.2	1852 (25.8%)	793 (11.0%)	212	174 (54.5%)	134 (42.0%)	68.3	7183
1990	5.4	927 (14.3%)	215 (3.3%)	177	91 (32.6%)	66 (23.7%)	46.7	6494
1991	3.1	1195 (14.4%)	138 (1.7%)	126	117 (32.3%)	61 (16.9%)	39.2	8316
1992	3.7	1103 (14.9%)	71 (1.0%)	78	109 (34.0%)	66 (20.6%)	17.7	7387
1993	3.8	1343 (16.7%)	201 (2.5%)	69	123 (35.4%)	86 (24.8%)	37.7	8061
1994	3.1	1214 (15.1%)	108 (1.3%)	57	119 (35.0%)	67 (19.7%)	19.7	8017
1995	3.3	1274 (15.2%)	73 (0.9%)	64	157 (43.1%)	64 (17.6%)	23.0	8359
1996	2.6	1043 (12.5%)	42 (0.5%)	62	112 (30.8%)	53 (14.6%)	18.8	8359
1997	2.5	1157 (13.9%)	42 (0.5%)	55	119 (32.7%)	37 (10.2%)	21.3	8347
1998	3.1	1488 (17.9%)	57 (0.7%)	51	138 (38.2%)	62 (17.2%)	26.1	8314
1999	2.5	1085 (13.4%)	44 (0.5%)	123	107 (30.2%)	43 (12.1%)	26.5	8117

Table 1.6
Annual Trend Summary of TRS Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >7$\mu g/m^3$	>28$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >3$\mu g/m^3$	>6$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of hours Instrument Operated
1980	5.9	1085 (16.0%)	449 (6.6%)	163	127 (45.0%)	85 (30.1%)	62.4	6772
1981	6.0	1276 (16.9%)	566 (7.5%)	241	136 (43.2%)	101 (32.1%)	53.8	7558
1982	5.3	1241 (15.1%)	445 (5.4%)	198	156 (45.5%)	111 (32.4%)	41.3	8235
1983	8.6	1670 (20.7%)	817 (10.1%)	177	180 (53.4%)	150 (44.5%)	90.5	8082
1984	4.7	978 (11.9%)	372 (4.5%)	227	121 (35.2%)	84 (24.4%)	51.7	8246
1985	4.8	875 (12.3%)	406 (5.7%)	297	106 (35.8%)	78 (26.4%)	81.6	7115
1986	7.9	1295 (20.1%)	677 (10.5%)	289	126 (46.8%)	102 (37.9%)	61.4	6456
1987	9.0	1806 (21.8%)	972 (11.7%)	218	174 (48.2%)	143 (39.6%)	69.0	8280
1988	7.3	1633 (19.7%)	792 (9.5%)	194	159 (44.0%)	121 (33.5%)	69.4	8297
1989	5.9	1376 (16.9%)	594 (7.3%)	184	140 (40.8%)	111 (32.4%)	41.8	8166
1990	2.7	905 (11.0%)	187 (2.3%)	122	100 (28.0%)	57 (16.0%)	47.0	8234
1991	2.2	925 (11.2%)	43 (0.5%)	58	84 (23.3%)	46 (12.8%)	19.4	8256
1992	2.1	882 (10.6%)	34 (0.4%)	69	89 (24.5%)	49 (13.5%)	18.4	8300
1993	2.4	956 (11.4%)	92 (1.1%)	72	89 (24.6%)	54 (14.9%)	29.8	8360
1994	1.9	790 (9.5%)	22 (0.3%)	67	84 (23.3%)	34 (9.4%)	19.1	8295
1995	1.9	757 (9.2%)	20 (0.2%)	44	93 (26.1%)	32 (9.0%)	20.5	8205
1996	1.7	622 (7.5%)	28 (0.3%)	103	71 (19.8%)	25 (7.0%)	27.2	8205
1997	1.6	654 (7.8%)	13 (0.2%)	40	65 (17.9%)	22 (6.0%)	12.9	8371
1998	2.2	958 (11.6%)	9 (0.1%)	50	88 (24.6%)	32 (8.9%)	19.5	8245
1999	1.7	784 (9.5%)	13 (0.2%)	44	71 (19.8%)	24 (6.7%)	18.5	8247

Table 1.7
Annual Trend Summary of TRS Data at Lakewood

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >7$\mu g/m^3$	No. (%) of 1-Hour Values >28$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >3$\mu g/m^3$	No. (%) of Daily Values >6$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of hours Instrument Operated
1982*	0.9	176 (3.0%)	22 (0.4%)	85	22 (9.1%)	13 (5.4%)	19.7	5785
1983	2.6	615 (7.9%)	147 (1.9%)	99	79 (24.5%)	43 (13.4%)	40.7	7737
1984	0.9	199 (2.4%)	15 (0.2%)	64	34 (9.9%)	10 (2.9%)	15.4	8269
1985	1.0	216 (2.9%)	28 (0.4%)	50	29 (9.3%)	12 (3.9%)	21.6	7456
1986	1.7	439 (5.6%)	110 (1.4%)	71	51 (15.7%)	32 (9.9%)	27.1	7807
1987	1.6	461 (6.0%)	106 (1.4%)	92	51 (15.6%)	34 (10.4%)	35.7	7680
1988	1.1	270 (3.6%)	38 (0.5%)	64	38 (11.8%)	23 (7.1%)	17.5	7462
1989	0.7	170 (2.8%)	33 (0.5%)	92	22 (8.1%)	8 (2.9%)	28.0	6057
1990	0.3	66 (1.2%)	3 (0.05%)	79	8 (3.4%)	1 (0.4%)	10.5	5484
1991	0.6	173 (2.3%)	3 (0.04%)	37	19 (5.7%)	4 (1.2%)	18.7	7667
1992	0.6	214 (2.6%)	0 (0.00%)	27	22 (6.0%)	9 (2.5%)	11.7	8351
1993	0.9	308 (4.4%)	6 (0.09%)	86	32 (10.7%)	13 (4.4%)	19.4	6952
1994	0.6	147 (1.8%)	2 (0.02%)	74	21 (5.9%)	4 (1.1%)	11.5	8196
1995	0.9	270 (3.2%)	2 (0.02%)	37	37 (10.2%)	11 (3.0%)	15.0	8358
1996	0.7	227 (2.7%)	8 (0.1%)	44	27 (7.5%)	7 (1.9%)	15.0	8281
1997	0.7	174 (2.1%)	0 (0.0%)	27	17 (4.8%)	4 (1.1%)	9.8	8211
1998	0.7	215 (2.6%)	0 (0.0%)	18	21 (6.0%)	5 (1.4%)	10.7	8204
1999	0.6	172 (2.1%)	1 (0.01%)	28	14 (4.0%)	5 (1.4%)	9.5	8191

* Instrument Operated June - December 1982

2.0 SULPHUR DIOXIDE (SO_2) RESULTS

Sulphur dioxide is formed primarily by the combustion of material containing sulphur. It is a colourless gas and at concentrations above 900 $\mu g/m^3$ (hourly Level B objective) has a pungent odour. At present, major sources of SO_2 in the Prince George area include the Husky refinery and the pulp mills.

The sulphur dioxide (SO_2) data are summarized in Tables 2.1- 2.4. The average annual ambient SO_2 levels were within the Provincial objectives at all stations. Only the CBC transmitter site recorded more than one Level A hourly exceedance, and the only site to record a daily exceedance in 1999. This station also recorded the highest one-hour average concentration (597 $\mu g/m^3$). Both Plaza and Gladstone did not record any exceedances of the Provincial objectives.

B.C. Ambient Air Quality Objectives Sulphur Dioxide (SO_2)	Level A	Level B
One Hour Average	450 $\mu g/m^3$	900 $\mu g/m^3$
24 Hour Average	160 $\mu g/m^3$	260 $\mu g/m^3$
Annual Average	25 $\mu g/m^3$	50 $\mu g/m^3$

Table 2.1
1999 Monthly Summary of SO_2 Data at Jail

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>450$\mu g/m^3$	>900$\mu g/m^3$		>160$\mu g/m^3$	>260$\mu g/m^3$	
January	10.6	0	0	250	0	0	103.9
February	11.7	0	0	216	0	0	43.0
March	16.0	0	0	213	0	0	78.6
April	7.8	0	0	170	0	0	50.1
May	8.0	0	0	280	0	0	40.1
June	5.4	0	0	165	0	0	39.2
July	11.0	0	0	200	0	0	49.1
August	17.7	0	0	280	0	0	69.2
September	9.9	0	0	306	0	0	72.01
October	8.3	0	0	298	0	0	51.6
November	9.0	0	0	250	0	0	44.0
December	4.9	0	0	144	0	0	32.0
Annual	**10.0**	**0**	**0**	**306**	**0**	**0**	**103.9**

Table 2.2
1999 Monthly Summary of SO_2 Data at Plaza

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>450$\mu g/m^3$	>900$\mu g/m^3$		>160$\mu g/m^3$	>260$\mu g/m^3$	
January	8.8	0	0	216	0	0	67.6
February	10.1	0	0	136	0	0	52.5
March	7.5	0	0	138	0	0	26.2
April	4.5	0	0	146	0	0	27.8
May	4.6	0	0	154	0	0	27.7
June	5.5	0	0	83	0	0	23.0
July	5.6	0	0	125	0	0	20.8
August	8.3	0	0	101	0	0	27.8
September	12.2	1	0	490	0	0	105.3
October	5.8	0	0	173	0	0	37.8
November	7.3	0	0	91	0	0	24.5
December	6.2	0	0	77	0	0	29.9
Annual	**7.2**	**1**	**0**	**490**	**0**	**0**	**105.3**

Table 2.3
1999 Monthly Summary of SO_2 Data at CBC Transmitter

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>450$\mu g/m^3$	>900$\mu g/m^3$		>160$\mu g/m^3$	>260$\mu g/m^3$	
January	8.9	1	0	570	0	0	53.0
February	10.6	0	0	378	0	0	66.4
March	25.6	6	0	751	1	0	227.1
April	11.4	0	0	394	0	0	122.9
May	8.8	0	0	210	0	0	41.7
June	16.4	0	0	314	0	0	87.9
July	15.2	0	0	352	0	0	66.2
August	20.7	0	0	421	0	0	77.9
September	12.0	1	0	533	0	0	92.1
October	10.1	1	0	490	0	0	89.0
November	13.0	2	0	474	0	0	86.2
December	2.9	0	0	341	0	0	50.1
Annual	**13.0**	**11**	**0**	**751**	**1**	**0**	**227.1**

Table 2.4
1999 Monthly Summary of SO_2 Data at Gladstone School

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>450$\mu g/m^3$	>900$\mu g/m^3$		>160$\mu g/m^3$	>260$\mu g/m^3$	
January	7.3	0	0	205	0	0	59.1
February	8.9	0	0	88	0	0	38.4
March	4.3	0	0	11	0	0	11.7
Annual	**6.8**	**0**	**0**	**205**	**0**	**0**	**59.1**

2.2 SO_2 Annual Trends

Table 2.5 summarizes the annual trend of SO_2 data collected at the Jail station. Prior to 1986, data was obtained from a Philips SO_2 continuous analyzer which was subject to interference from various TRS compounds resulting in erroneous data. In 1986 the Philips analyzer was replaced with a TECO analyzer utilizing newer technology. The SO_2 average for 1986 is based upon Philips data for Jan. - Feb. and TECO monitor data for Mar. - Dec. The lower annual averages after 1986 are attributable to the improved accuracy of data provided by the new monitor.

The trend in ambient SO_2 levels recorded at the Jail site from 1990 to 1996 had shown an increase. However, since 1996, SO_2 levels have been decreasing at this site. The annual concentration at the Jail site in 1999 has been the lowest recorded since 1991.

Table 2.5
Annual Trend Summary of SO_2 Data at Jail

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	>900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	>260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1981	10.7	1	0	506	0	0	75.2	7,016
1982	25.5	1	0	719	0	0	161.4	6,535
1983	31.8	1	0	533	0	0	143.5	8,310
1984	22.9	6	1	1198	3	0	242.8	7,551
1985	21.0	0	0	399	0	0	119.3	7,860
1986*	16.9	4	0	538	0	0	152.5	8,278
1987	12.8	2	0	666	0	0	123.0	8,348
1988	13.8	8	0	586	1	0	173.8	8,412
1989	12.0	1	0	659	0	0	99.6	8,165
1990	5.5	0	0	283	0	0	56.7	6,719
1991	8.7	1	0	492	0	0	118.1	8,236
1992	12.1	1	0	450	0	0	104.0	8,363
1993	10.9	0	0	363	0	0	81.8	8,225
1994	12.5	1	0	469	0	0	123.0	8,162
1995	20.5	1	0	530	0	0	118.8	8,354
1996	23.7	10	0	735	2	0	189.8	8,368
1997	20.5	4	0	759	0	0	143.2	8,350
1998	18.6	1	0	469	0	0	129.0	7,580
1999	10.0	0	0	306	0	0	103.9	8,358

* Philips analyzer was replaced with a TECO analyzer

Tables 2.6 to 2.8 summarizes the annual trend of SO_2 data collected at the Plaza, CBC and Gladstone sites, respectively. In 1999, ambient levels of SO_2 at both the Plaza and CBC transmitter sites were the lowest recorded since monitoring began at these sites. Consistent low levels in College Heights (Gladstone School) resulted in a decision to cease monitoring at that location.

Table 2.6
Annual Trend Summary of SO_2 Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	>900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	>260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1995	12.8	2	0	474	0	0	156.3	5,323*
1996	15.8	13	1	913	1	0	167.9	8,229
1997	14.6	8	0	663	0	0	118.3	8,363
1998	11.9	0	0	399	0	0	93.5	8,220
1999	7.2	1	0	490	0	0	105.3	8,703

* Instrument installed May 1995

Table 2.7
Annual Trend Summary of SO_2 Data at CBC

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	No. of 1-Hour Values >900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	No. of Daily Values >260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1995	17.8	4	0	597	0	0	101.1	5,096*
1996	23.9	10	0	794	4	0	189.3	8,370
1997	20.1	9	0	778	2	0	197.7	8,312
1998	22.6	10	0	597	1	0	224.0	8,361
1999	13.0	11	0	751	1	0	227.1	8,560

* Instrument installed May 1995

Table 2.8
Annual Trend Summary of SO_2 Data at Gladstone

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	No. of 1-Hour Values >900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	No. of Daily Values >260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1995	6.6	0	0	269	0	0	96.3	5,430*
1996	10.5	0	0	280	0	0	85.4	8,370
1997	10.5	0	0	314	0	0	148.5	8,351
1998	7.9	0	0	160	0	0	76.5	8,269
1999	-	0	0	205	0	0	59.1	1,424**

* Instrument installed May 1995
** Instrument removed March 1999

3.0 NITROGEN DIOXIDE (NO_2) RESULTS

Nitrogen dioxide is a reddish-brown gas with a pungent and irritating odour over 250 $\mu g/m^3$. The NO_2 absorbs short wave blue light, leaving longer wavelengths that cause it to appear reddish-brown.

NO_2 is emitted as a primary pollutant (emitted directly from high temperature combustion sources) or a secondary pollutant (produce from the oxidation of nitric oxide). Nitric oxide is formed during high temperature combustion, primarily from motor vehicle exhausts and stationary combustion (such as industrial processes, waste incineration, and fuel combustion for heating homes and buildings). Emissions of nitric oxide are greater during winter months when there is an increase in the use of heating fuels and in the idling of cars.

The nitrogen dioxide data from the Plaza site is summarized in Tables 3.1. Ambient NO_2 levels were well within the Provincial objectives, with no Level A hourly or daily exceedances.

Table 3.1.
1999 Monthly Summary of NO_2 Data at Plaza

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. Of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>400$\mu g/m^3$	>1000$\mu g/m^3$	($\mu g/m^3$)	>200$\mu g/m^3$	>300$\mu g/m^3$	($\mu g/m^3$)
January	31.1	0	0	117	0	0	75.6
February	40.4	0	0	140	0	0	89.4
March	42.0	0	0	143	0	0	81.6
April	25.9	0	0	88	0	0	45.9
May	18.1	0	0	138	0	0	34.2
June	17.3	0	0	71	0	0	32.3
July	14.1	0	0	67	0	0	29.6
August	13.8	0	0	63	0	0	28.6
September	18.9	0	0	67	0	0	37.5
October	23.3	0	0	94	0	0	60.2
November	23.1	0	0	80	0	0	51.0
December	40.4	0	0	128	0	0	99.1
Annual	**25.6**	**0**	**0**	**143**	**0**	**0**	**99.1**

B.C. Ambient Air Quality Objectives ..... Level B Level C
Nitrogen Dioxide (NO_2)

One Hour Average	400 $\mu g/m^3$	1000 $\mu g/m^3$
24 Hour Average	200 $\mu g/m^3$	300 $\mu g/m^3$
Annual Average	60 $\mu g/m^3$	100 $\mu g/m^3$

3.1 NO_2 Annual Trends

A trend discussion has not been available previously due to the shortage of data particularly in 1992 and 1995. A trend in NO_2 levels does not appear to be apparent as shown in Table 3.2. Annual average NO_2 levels in 1999 were the third highest to be recorded out of the eight full years of monitoring. The highest maximum daily NO_2 average ever recorded in Plaza occurred on February 9 1999.

Table 3.2
Annual Trend Summary of NO_2 Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >400$\mu g/m^3$	No. of 1-Hour Values >1000$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of 24 Hour Values >200$\mu g/m^3$	No. of 24 Hour Values >300$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1992	22.5	0	0	61	0	0	97.0	4,825*
1993	25.4	0	0	149	0	0	83.3	8,072
1994	23.7	0	0	130	0	0	70.7	7,852
1995	26.3	0	0	101	0	0	61.5	4,957**
1996	25.9	0	0	151	0	0	84.6	7,787
1997	24.3	0	0	186	0	0	91.5	8,242
1998	28.7	0	0	143	0	0	67.1	8,051
1999	25.6	0	0	143	0	0	99.1	8,218

* Note: NO_2 TECO Analyzer Installed in June 1992
** Note NO_2 TECO Operational Problems

4.0 OZONE (O_3) RESULTS

Ground level ozone is produced when oxides of nitrogen (NO_x) react with volatile hydrocarbons in the presence of sun light. Ozone is termed a secondary pollutant because it is produced from a photochemical reaction involving primary pollutants (NO_x and volatile hydrocarbons).

Tables 4.1 summarizes the ozone data recorded at the Plaza station. The maximum one-hour level (140 $\mu g/m^3$) was recorded on August 5th. The greatest number of exceedances of the one-hour objective occurred in April. Exceedances of the one-hour Level A objective in 1999 occurred between the months of February and October. Exceedances of the 24-hour Level A objective occurred four or more days during every month in 1999. September was the only month in which there was no exceedance of the 24-hour Level B objective. There is some debate whether the daily objective is below the background level for ozone.

Table 4.1
1999 Monthly Summary of O_3 Data for Plaza

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>100$\mu g/m^3$	>160$\mu g/m^3$		>30$\mu g/m^3$	>50$\mu g/m^3$	
January	29.0	0	0	84	16	2	68.1
February	45.7	18	0	108	19	10	102.0
March	53.8	23	0	112	29	15	94.8
April	58.6	42	0	124	29	18	98.1
May	54.6	41	0	118	22	18	105.4
June	45.6	6	0	108	28	9	90.8
July	36.9	1	0	104	22	5	59.9
August	31.0	4	0	140	16	1	55.3
September	18.7	0	0	72	4	0	36.5
October	28.5	5	0	112	11	3	76.3
November	24.4	0	0	92	11	2	65.4
December	26.6	0	0	82	15	3	64.3
Annual	**37.8**	**140**	**0**	**140**	**222**	**86**	**102.0**

B.C. Ambient Air Quality Objectives Ozone (O_3)	Level A	Level B
One Hour Average	100 $\mu g/m^3$	160 $\mu g/m^3$
24 Hour Average	30 $\mu g/m^3$	50 $\mu g/m^3$
Annual Average		30 $\mu g/m^3$

4.1 O_3 Annual Trends

A discussion in the trend has not been available previously due to the shortage of data since installation occurred in 1995. Annual average O_3 level in 1999 was higher than the annual average of the previous three full years of data, and there were more daily exceedance of the Level A objective in 1999.

Table 4.2
Annual Trend Summary of O_3 Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
		>100$\mu g/m^3$	>160$\mu g/m^3$		>30$\mu g/m^3$	>50$\mu g/m^3$		
1995	30.3	28	0	112	108	29	75.2	5,548*
1996	35.2	21	0	120	202	83	88.3	8,290
1997	35.2	54	0	120	217	88	81.8	8,358
1998	37.2	159	0	156	214	93	100.0	8,284
1999	37.8	140	0	140	222	86	102.0	8,638

* Note: O_3 API Analyzer installed in late April 1995

5.0 PARTICULATE MATTER (PM_{10}) RESULTS

Particulate matter refers to small particles ranging in size from 0.001 μm (micrometres) to 100 μm. Particles range in chemical composition, size, shape, and physical properties. Sources of particles are either natural sources such as pollen, dust from soil erosion, volcanoes or man-made sources such as soot, flyash and smoke. In Prince George sources of particulate are industries, wood waste burners, road dust, sawmills, motor vehicles, burning of fuels for heating, and some natural sources.

Larger particulate may cause a nuisance or irritation problem but smaller particulate (less than 10 μm) cause the greatest health effect because they are inhaled deep into the lung cavities. Particles in this size range usually come from man-made sources, internal combustion engines, industrial processes, burning, and road dust.

Particulate matter less than 10 micrometres (PM_{10}) is measured either non-continuously (once every sixth day when samplers are run for 24 hours at a time) (six locations in Prince George), or continuously, using a tapered element oscillating microbalance technology (TEOM).

Table 5.1 summarizes the PM_{10} data from both the continuous and non-continuous monitors in Prince George for 1999. Annual averages ranged from a low of 17.1 $\mu g/m^3$ at Gladstone to a maximum of 34.0 $\mu g/m^3$ at the CNR site. The maximum 24-hour average, 144 $\mu g/m^3$ was recorded at Hart.

Table 5.1
1999 Airshed Summary of PM_{10}

Station	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values			Maximum Daily ($\mu g/m^3$)	Minimum Daily ($\mu g/m^3$)	No. of Values
		>50$\mu g/m^3$	>100$\mu g/m^3$	>150$\mu g/m^3$			
Plaza	21.4	2	0	0	73	5	60
Plaza - (TEOM)	17.8	10	0	0	74	2	362
Lakewood	17.4	1	0	0	74	5	56
Van Bien	22.7	3	0	0	56	6	58
CNR Site	28.0	8	1	0	106	8	59
BCR Site #2	21.3	20	0	0	79	1	363
Gladstone	12.7	0	0	0	47	1	363
Hart-Glenview	9.2	0	0	0	27	3	363

B.C. Ambient Air Quality Objectives for PM_{10}: .....Level B
24 Hour ..... 50 $\mu g/m^3$

5.1 PM_{10} Continuous Monitors

PM_{10} is continuously sampled on top of the Plaza 400 building, Gladstone Elementary, Glenview School and the BCR Warehouse with a TEOM (tapered element oscillating microbalance) 1400a PM_{10} sampler. The principle of operation is to draw a constant sample of air through a filter, continuously weighing the filter (every two seconds) and calculating real time (10 minute) mass concentrations. The instrument also calculates 30 minute, one hour, eight hour, and twenty-four hour averages of mass concentration. The initial weight of the filter is compared to the present weight to produce the total mass of the collected particulate.

The continuous PM_{10} monitor at the Hart Highlands BC Tel location was removed in March 1998 but re-established in June 1998 at Glenview School.

5.1.1 PM_{10} Results

Tables 5.2 to 5.5 summarize the continuous PM_{10} monitoring at the five monitoring sites in Prince George. Monthly concentrations ranged from 7.1 $\mu g/m^3$ (at Glenview on May) to 31.4 $\mu g/m^3$ (at Plaza on March). The maximum hourly levels reached 380 $\mu g/m^3$ at the BCR site whereas the maximum 24-hour level (98 $\mu g/m^3$) was recorded at Plaza.

Table 5.2
1999 Monthly Summary of Continuous PM_{10} Data at Plaza

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	13.3	95	0	0	36	4.6
February	14.2	84	0	0	45	5.4
March	31.4	211	5	0	98	6.1
April	22.8	193	3	0	69	1.8
May	12.7	91	0	0	43	2.6
June	15.5	128	0	0	49	3.7
July	17.0	110	0	0	40	2.7
August	17.8	90	0	0	48	4.8
September	23.0	138	1	0	57	4.4
October	17.0	126	0	0	44	3.7
November	14.6	100	0	0	32	3.8
December	14.2	93	1	0	54	3.5
Annual	**17.8**	**211**	**10**	**0**	**98**	**1.8**

Table 5.3
1999 Monthly Summary of Continuous PM_{10} Data at Gladstone

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	9.8	61	0	0	35	1.2
February	11.0	72	0	0	44	2.3
March	17.1	127	0	0	43	3.6
April	15.4	103	0	0	45	2.3
May	9.0	56	0	0	31	2.7
June	10.6	53	0	0	27	2.1
July	12.1	69	0	0	29	3.4
August	13.3	77	0	0	36	4.4
September	17.2	69	0	0	42	5.1
October	13.3	63	0	0	27	4.2
November	13.3	140	0	0	32	3.8
December	10.6	72	0	0	47	2.9
Annual	**12.7**	**127**	**0**	**0**	**47**	**1.2**

Table 5.4
1999 Monthly Summary of Continuous PM_{10} Data at BCR

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	17.8	92	0	0	45	5.5
February	19.8	128	0	0	50	5.8
March	28.5	133	3	0	78	4.2
April	27.4	231	6	0	82	2.0
May	16.3	163	1	0	63	3.9
June	19.6	150	1	0	58	3.6
July	22.2	380	1	0	63	3.2
August	22.6	312	2	0	59	4.0
September	25.7	189	4	0	60	4.2
October	21.5	111	1	0	56	4.2
November	18.4	94	0	0	36	7.7
December	15.6	98	1	0	56	4.4
Annual	**21.3**	**380**	**20**	**0**	**82**	**2.0**

Table 5.5
1999 Monthly Summary of Continuous PM_{10} Data at Hart Highlands - Glenview

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values >50$\mu g/m^3$	No. of Daily Values >100$\mu g/m^3$	Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
January	7.8	42	0	0	18	2.9
February	7.5	99	0	0	21	3.9
March	10.4	84	0	0	28	3.3
April	9.0	47	0	0	17	3.0
May	7.1	44	0	0	14	3.9
June	8.4	92	0	0	22	3.9
July	10.0	72	0	0	26	2.4
August	10.0	221	0	0	28	3.5
September	12.1	46	0	0	26	3.5
October	10.2	37	0	0	21	4.0
November	8.9	37	0	0	19	3.0
December	9.4	48	0	0	34	3.2
Annual	**9.2**	**221**	**0**	**0**	**34**	**2.4**

5.1.2 PM_{10} Annual Trends (Continuous Monitors)

In 1999, all four continuous TEOM monitors recorded the lowest annual average PM_{10} levels since monitoring began at these sites. The TEOM monitor at Plaza was sent for upgrades at the end of 1993. The annual average of the TEOM has usually been lower (1993 and 1994) than the discontinuous monitor and 1999 continued that trend with a difference of about 3.5 $\mu g/m^3$.

The TEOMs located at Gladstone School and the BC Rail Warehouse (Tables 5.8 and 5.9, respectively) have been operating since late December 1995 and October 1996, respectively, but have not operated long enough for any trend discussion. However, both sites did record the highest annual averages in 1998, and the lowest annual averages in 1999.

Table 5.6
Annual Trend Summary of the Continuous PM_{10} Data at Plaza

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1992	21.6	488	18 (6.1%)	0 (0%)	80	7,083
1993	22.3	171	11 (4.5%)	0 (0%)	75	5,828
1994*	22.3	284	19 (5.6%)	4 (1.2%)	117	8,162
1995	24.2	291	33 (9.1%)	2 (0.6%)	108	8,686
1996	20.5	373	10 (2.8%)	3 (0.8%)	152	8,567
1997	20.2	208	13 (3.6%)	0 (0%)	76	8,719
1998	22.7	319	20 (5.5%)	2 (0.5%)	114	8,719
1999	17.8	211	10 (2.7%)	0 (0%)	98	8,609

* Monitor returned in January after upgrades

Table 5.7
Annual Trend Summary of the Continuous PM_{10} Data at Gladstone

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1996	15.0	253	7 (1.9%)	1 (0.3%)	102	8,688
1997	14.8	155	7 (1.9%)	0 (0%)	61	8,673
1998	17.2	207	7 (1.9%)	0 (0%)	74	8,642
1999	12.7	127	0 0	0 0	47	8,663

Table 5.8
Annual Trend Summary of the Continuous PM_{10} Data at BCR

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1996*	21.3	125	5 (1.9%)	0 (0.3%)	69	2,257
1997	24.2	401	32 (8.9%)	2 (0.6%)	107	8,673
1998	29.1	582	49 (13.4%)	4 (1.1%)	127	8,702
1999	21.3	380	19 (5.2%)	0 0	82	8,718

* analyzer installed in October 1996

5.2 PM_{10} Annual Trends (Non-continuous Monitors)

Simialr to the continuous TEOM monitors, All stations showed lower annual averages in PM_{10} levels in 1999 compared to the previous year, but unlike the TEOM monitors, annual averages were higher than in 1997. Tables 5.9 - 5.15 show the annual summary of PM_{10} data from all the monitoring sites.

Table 5.9
Annual Trend Summary of Non-Continuous PM_{10} Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	22.8	2 (7.7%)	0	90	26
1991	29.4	7 (11.7%)	1 (1.7%)	217	60
1992	28.6	6 (10.2%)	0	92	59
1993	30.2	10 (16.7%)	0	92	60
1994	24.1	6 (10.0%)	0	85	61
1995	23.6	4 (6.6%)	0	85	61
1996	21.9	2 (3.3%)	0	61	61
1997	20.8	1 (1.7%)	0	56	61
1998	26.9	5 (8.2%)	1 (1.6%)	111	61
1999	21.4	2 (3.4%)	0	73	59

Table 5.10
Annual Trend Summary of Non-Continuous PM_{10} Data at Van Bien

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	30.0	7 (26.9%)	0	62	26
1991	27.6	8 (13.6%)	0	84	59
1992	27.0	7 (12.5%)	0	89	56
1993	27.9	6 (10.2%)	0	99	59
1994	21.8	3 (6.3%)	0	69	48
1995	25.2	6 (10.2%)	1 (1.7%)	106	59
1996	23.4	3 (7.3%)	0	58	41
1997	20.8	3 (5.3%)	0	74	57
1998	28.3	6 (10.9%)	0	91	55
1999	22.7	3 (5.2%)	0	56	58

Table 5.11
Annual Trend Summary of Non-Continuous PM_{10} Data at Lakewood

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	17.4	0	0	40	24*
1991	21.8	5 (8.5%)	0	89	59
1992	24.8	7 (11.9%)	0	74	59
1993	27.3	4 (7.6%)	1 (1.9%)	129	53
1994	18.9	1 (1.7%)	0	56	58
1995	18.7	4 (7.4%)	0	63	54
1996	16.3	0	0	50	59
1997	15.9	1 (1.7%)	0	51	59
1998	19.6	1 (1.9%)	0	61	54
1999	17.4	1 (1.8%)	0	74	56

* Note: High volume samplers converted to PM_{10} (August 1,1990). Therefore PM_{10} data is for a 5 month duration.

Table 5.12
Annual Trend Summary of Non-Continuous PM_{10} Data at the CNR Site

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1991	30.9	5 (13.2%)	2 (5.3%)	124	38
1992	28.3	6 (10.3%)	1 (1.7%)	103	58
1993	33.3	14 (23.0%)	1 (1.6%)	104	61
1994	25.2	8 (13.6%)	0	75	59
1995	27.5	8 (13.3%)	1 (1.7%)	110	60
1996	28.1	5 (8.3%)	1 (1.7%)	110	60
1997	22.8	2 (3.6%)	0	65	55
1998	34.0	8 (13.8%)	2 (3.4%)	124	58
1999	28.0	8 (13.6%)	1 (1.7%)	106	59

Table 5.13
Annual Trend Summary of Non-Continuous PM_{10} Data at the BCR Site #1

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	41.6	8 (21.6%)	3 (8.1%)	132	37
1991	49.3	8 (50.0%)	1 ((6.3%)	122	16*
1992	31.3	2 (9.1%)	0	76	22**
1993	43.2	17 (28.8%)	2 (3.4%)	147	59
1994	38.4	12 (21.1%)	2 (3.5%)	143	57
1995	40.9	16 (31.4%)	3 (5.9%)	181	51
1996	43.9	9(24.3%)	2 (5.4%)	153	37***

* Note: Station relocated to CNR site May 6, 1991.
** Note: Monitoring started July 29, 1992.
***Note: Station closed August 20 1996 and relocated to BCR #2 site

Table 5.14
Annual Trend Summary of Non-Continuous PM_{10} Data at the BCR Site #2

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1996	31.8	4 (11.4%)	0	79	35*
1997	26.0	4 (7.1%)	0	75	61
1998	31.7	10(16.4%)	0	92	61

* Note: Monitoring started June 2, 1996.

Table 5.15
Annual Trend Summary of Non-Continuous PM_{10} Data at Gladstone

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1992	19.5	1 (3.2%)	0	54	31*
1993	25.8	5 (8.8%)	1 (1.8%)	122	57
1994	16.8	0	0	50	60
1995	16.7	2 (3.3%)	0	63	60
1996	15.4	0	0	49	59
1997	15.3	1 (1.7%)	0	57	61
1998	20.2	2 (3.3%)	0	57	61

* Note: Monitoring started June 5, 1992.

5.4 $PM_{2.5}$ Results

The Ministry operates one continuous $PM_{2.5}$ (particulate matter less than 2.5 micrometres) monitor, which is located at the Plaza site. The $PM_{2.5}$ monitor operates in the same manner as the TEOM PM_{10} monitors. The only difference is the head on this monitor allows only particles less than 2.5 µm to reach the filter. Similar to the PM_{10} data, the lowest monthly average occurred in May. However the maximum $PM_{2.5}$ monthly average occurred in September, whereas the maximum PM_{10} monthly average occurred in March.

Table 5.16
1999 Monthly Summary of Continuous $PM_{2.5}$ Data at Plaza

	Monthly Average (µg/m³)	Maximum Hourly (µg/m³)	No. of Daily Values >25µg/m³	No. of Daily Values >50µg/m³	Maximum 24 Hour (µg/m³)	Minimum 24 Hour (µg/m³)
January	11.4	96	1	0	30.6	3.9
February	11.4	85	1	0	36.9	2.5
March	12.8	78	1	0	29.5	3.1
April	9.4	99	0	0	20.7	2.0
May	7.1	36	0	0	15.9	3.3
June	8.2	37	0	0	18.8	2.6
July	9.5	86	0	0	24.7	1.7
August	10.2	58	0	0	25.0	2.2
September	14.9	124	5	0	38.2	3.0
October	12.8	77	1	0	28.6	3.7
November	13.1	75	1	0	28.4	4.0
December	11.6	81	2	0	36.3	3.8
Annual	**11.0**	**124**	**12**	**0**	**38.2**	**2.0**

5.5 $PM_{2.5}$ Annual Trend (Non-continuous Monitor)

The Ministry operates one non-continuous $PM_{2.5}$ monitor, which is located at the Plaza site. $PM_{2.5}$ is measured by drawing air through a size selective inlet prior to collection on a teflon fibre filter at a rate of about 0.017 cubic metres per minute. The sampler is run for 24 hours at a time on a 6 day cycle (i.e., once every sixth day).

Table 5.17 shows the annual trend summary of $PM_{2.5}$ data for the last six years at Plaza, which shows a steady decrease in levels.

Table 5.17
Annual Trend Summary of Non-Continuous $PM_{2.5}$ Data at Plaza

Year	Annual Average (µg/m³)	No. (%) of Daily Values > 25 µg/m³	No. (%) of Daily Values > 50 µg/m³	Maximum Daily Value (µg/m³)	Number of Samples
1994*	13.5	1 (4.5%)	1 (4.5%)	52	22
1995	13.3	5 (8.8%)	1 (1.8%)	54	57
1996	12.7	4 (6.7%)	0	40	60
1997	12.3	6 (9.8%)	0	43	61
1998	11.4	5 (8.3%)	1 (1.7%)	52	60
1999	9.9	2 (3.6%)	0	38	55

* Instrument installed August 1994